

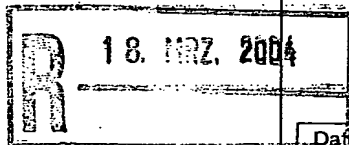
# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

## PCT

To:

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SUISSE



NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing  
(day/month/year)

16.03.2004

Applicant's or agent's file reference  
2002FR301

**IMPORTANT NOTIFICATION**

International application No.  
PCT/B 03/00535

International filing date (day/month/year)  
12.02.2003

Priority date (day/month/year)  
13.02.2002

Applicant  
CLARIANT INTERNATIONAL LTD et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/B/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:



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# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)



REC'D 17 MAR 2004

WIPO PC

Applicant's or agent's file reference 2002FR301	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/B 03/00535	International filing date ( <i>day/month/year</i> ) 12.02.2003	Priority date ( <i>day/month/year</i> ) 13.02.2002
International Patent Classification (IPC) or both national classification and IPC C09G1/02		
Applicant CLARIANT INTERNATIONAL LTD et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:
  - I ☒ Basis of the opinion
  - II ☐ Priority
  - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain documents cited
  - VII ☐ Certain defects in the international application
  - VIII ☐ Certain observations on the international application

Date of submission of the demand  23.07.2003	Date of completion of this report  16.03.2004
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Krätzschmar, U  Telephone No. +49 89 2399-2137  

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/B 03/00535**

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-12 as originally filed

**Claims, Numbers**

1-10 received on 15.01.2004 with letter of 14.01.2004

**Drawings, Sheets**

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/B 03/00535**

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-10
	No: Claims	
Inventive step (IS)	Yes: Claims	1-10
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-10
	No: Claims	

2. Citations and explanations

**see separate sheet**

**Ad section V.:**

1. In the light of the available prior art the subject-matter of present claims 1-10 is considered to be novel (Art. 33(2) PCT).

Document US-A-6 043 159 (D1) describes a chemical mechanical polishing process wherein an abrasive comprising an acid aqueous suspension of individualized particles of colloidal silica having a mean particle size of 3 to 250 nm is used. The additional use of an oxidizing agent is not mentioned and in contrast to the present application, it is the insulator layer which is to be polished.

2. The subject-matter of claims 1-10 is also considered as involving an inventive step (Art. 33(3) PCT).

It is the aim of the present invention to provide an abrasive composition for the chemical-mechanical polishing in one stage of substrates containing at least one metal layer and one insulator layer, wherein said abrasive composition enables a uniform polishing of the metal layer at a high polishing speed and also a high selectivity between the polishing of the metal and that of the insulator (see p.2, lines 11-14 and p.3, lines 13-21). Said problem is solved by the abrasive compositions according to present claim 7 as can be seen from Experiments 1 to 3 in the application.

EP-A-1 125 999 (D2) does disclose a polishing composition having a high removal rate of the metal layer compared to a low removal rate of the insulator layer, but it is not used in a single stage polishing process. Nor does said composition comprise individualized particles of colloidal silica and the presence of an anticorrosive is essential. D2 thus does not suggest a polishing process according to present claim 1 nor an abrasive composition according to claim 7.

**CLAIMS**

1. A chemical-mechanical polishing process for substrates used in the micro-electronics semiconductors industry containing at least one metal layer and one  
5 insulator layer, separated, if necessary, by a barrier layer, in which the metal layer or layers and the barrier layer or layers are subjected to friction using a polishing pad by moving the substrate with respect to the pad and by pressing the substrate against the said pad, and an abrasive composition is deposited on the pad during the polishing, characterized in that the said process is carried out  
10 in a single stage, in that the abrasive composition comprises:

- an acid aqueous suspension of individualized particles of colloidal silica, not linked to each other by siloxane bonds, having a mean particle diameter of between 5 and 20 nm,
- 15 - an oxidizing agent,

and in that the metal layer and, if applicable, the barrier layer, is or are eliminated from the surface of the insulator in order to obtain a metal and insulator surface not requiring any finishing polishing.

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2. A chemical-mechanical polishing process according to claim 1, characterized in that the metal layer is produced from a metal selected from the group comprising aluminium, copper and tungsten, preferably tungsten, and that the barrier layer is  
25 produced from a material selected from the group comprising titanium, tantalum, titanium nitride, tantalum nitride and any combination or alloy of at least two of them.

3. A chemical-mechanical polishing process according to claim 1 or 2, characterized  
30 in that the insulator layer is selected from the group comprising silicon oxide, tetraethoxysilane oxide, phosphosilicate glass, borophosphosilicate glass and polymers with a low dielectric constant, preferably from the group comprising silicon oxide, tetraethoxysilane oxide, phosphosilicate glass and borophosphosilicate glass.

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4. A chemical-mechanical polishing process according to one of claims 1 to 3,

characterized in that the oxidizing agent is an iodate, preferably potassium iodate or sodium iodate and that the oxidizing agent is used at a concentration by weight of between 0.1 and 15%, preferably at a concentration by weight of between 2 and 5%.

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5. A chemical-mechanical polishing process according to one of claims 1 to 4, characterized in that the mean diameter of the individualized particles of colloidal silica, not linked to each other by siloxane bonds, is between 7 and 15 nm, preferably between 9 and 12 nm and that the acid aqueous suspension of colloidal silica is used at a concentration by weight of silica of between 0.1 and 15%, preferably at a concentration by weight of silica of between 2 and 5%.

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6. A chemical-mechanical polishing process according to one of claims 1 to 5, characterized in that the acid aqueous suspension of colloidal silica is used at a pH of between 1 and 5, preferably between 1.5 and 3.

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7. An abrasive composition for the chemical-mechanical polishing in one stage of substrates used in the microelectronics semiconductors industry containing at least one metal layer and one insulator layer, characterized in that the said abrasive composition comprises:

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- an acid aqueous suspension of individualized particles of colloidal silica, not linked to each other by siloxane bonds, having a mean particle diameter of between 5 and 20 nm,
- an oxidizing agent,

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and in that it is substantially free of anti-corrosion agent (< 0.05 % by weight).

8. A composition according to claim 7, characterized in that the oxidizing agent is an iodate, preferably potassium iodate or sodium iodate, and that the oxidizing agent is present at a concentration by weight of between 0.1 and 15%, preferably between 2 and 5%.

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9. A composition according to claim 7 or 8, characterized in that the mean diameter of the individualized particles of colloidal silica, not linked to each other by

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siloxane bonds, is between 7 and 15 nm, preferably between 9 and 12 nm.

10. A composition according to one of claims 7 to 9, characterized in that the acid aqueous suspension of colloidal silica has a concentration by weight of silica of between 0.1 and 15%, preferably between 2 and 5%, and has a pH of between 1 and 5, preferably between 1.5 and 3.